

# **Overview of ACCENT Near Tropopause Measurements**

**Randall R. Friedl  
Jet Propulsion Laboratory**

**&**

**Martin N. Ross  
Aerospace Corporation**



**California Institute of Technology**

**ACCENT Special Session  
AGU Fall Meeting  
San Francisco, California  
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## **Background**

ACCENT (Atmospheric Chemistry of Combustion Emissions Near the Tropopause) was a multi-agency (i.e. NASA, NOAA, NSF, and the US Air Force) sponsored mission designed to investigate the chemistry of rocket and aircraft emissions in the upper troposphere and lower stratosphere. The mission utilized the NASA WB-57 aircraft and was based at Ellington Field in Houston, Texas. The science payload consisted of 25 instruments capable of measuring a broad range of gases and particles.

## **Background (continued)**

The primary mission objectives related to aircraft emissions were:

- 1) Measure the distribution and characteristics of aerosol in and around continental air traffic corridors
- 2) Relate measured particle features to primary aerosol sources through correlation with measured gaseous tracers and meteorological analysis
- 3) Obtain simultaneous measurements of CN, CCN and particle composition in air heavily influenced by aviation

# ACCENT Instruments and Science Team

Instrument	Measurement	Investigator
PTW	pressure, temperature and winds	T.Thomson, NOAA
MTP	microwave temperature profile	M. Mahoney, JPL
CORE	ClO and CO <sub>2</sub>	D. Toohey, U. Colo
LACE	gas chromatography	J. Elkins, NOAA
MASP	aerosol size and number	B. Gandrud, NCAR
PALMS	aerosol composition	D. Murphy, NOAA
FCAS/CNC	aerosol size and number	J. Wilson, U. Denver
NMASS	aerosol surface area	C. Brock, NOAA
RPM/GTS	aerosol size and number	P. Whitefield, U. Missouri-Rolla
TDL	CH <sub>4</sub>	E. Richard, NOAA
NIRTDL	CO and N <sub>2</sub> O	M. Coffey, NCAR
NOAA Ozone	O <sub>3</sub>	E. Richard, NOAA

## ACCENT Instruments and Science Team (cont.)

Instrument	Measurement	Investigator
PSI Ozone	O <sub>3</sub>	T. Rawins, PSI
JLH	open path water vapor	R. Herman, JPL
H <sub>2</sub> O	total water	K. Kelly, NOAA
WAS	gaseous tracers	E. Atlas, NCAR
CCN	cloud condensation nuclei	R. Flagan, Caltech
NCAR Noy	reactive nitrogen	B. Ridley, NCAR
NOAA CIMS	HNO <sub>3</sub>	R. Gao and D. Fahey, NOAA
CPFM	UV and visible flux	T. McElroy, AES
Met. Analysis	UT/LS meteorological and aircraft exposure predictions	P. Newman, GSFC H. Selkirk, Ames K. Rosenlof, NOAA
Mission Management		R. Friedl, JPL M. Ross, Aerospace A. Tuck, NOAA D. Anderson, APL

# ACCENT Mission Summary

## Spring 1999 Deployment

- 4/5 Deployment start
- 4/7 Test flight to Albuquerque, New Mexico (jet stream transit)
- 4/9 Test/Science flight to CCAS, Florida
- 4/12 Atlas IIAS rocket sampling at CCAS
- 4/15 Delta II rocket sampling at VAFB
- 4/22 Sampling of Gulf air influenced by convection from Tropical Pacific
- 4/23 Sampling of Gulf air influenced by convection from Tropical Pacific

## Fall 1999 Deployment

- 8/31 Deployment start
- 9/3 Test flight to Topeka, Kansas (RAOB sites overpass)
- 9/8 Test flight to Topeka, Kansas
- 9/13 Test flight to Atlantic Ocean
- 9/15 Hurricane Floyd overflight
- 9/17 Aircraft exhaust sampling near Dallas, Texas
- 9/20 Tropical air sampling with landing in Costa Rica
- 9/21 Tropical air sampling on return flight from Costa Rica
- 9/22 Test flight into stratosphere
- 9/24 Athena rocket sampling at VAFB

## **September 17, 1999 Flight**

Meteorological forecasts provided by NASA Ames and Goddard investigators indicated that a significant amount of aircraft exhaust would accumulate over northern Texas on September 17. Moreover, the forecasts suggested that the area would be relatively unaffected by material convected from the surface. The WB-57 aircraft executed a series of level flight legs that were centered over downtown Dallas. Each leg lasted for about 30 minutes (300 km). The flight altitudes sampled (in order of sampling) were 35 kft, 31 kft, 33 kft, 37 kft, 39 kft and 41 kft.

## **Preliminary Observations and Conclusions (continued)**

Particles sampled during ACCENT show remarkable variability in composition. In general, a significant fraction of the UT aerosol is composed of soot or other organic constituents. In several instances, large soot concentrations have been seen at altitudes of 53 kft in the Gulf of Mexico and off the Central American coast. Initial analysis of the September 17 particle data does not reveal any dramatic features attributable to aircraft. Large particle concentrations are low and the particles are mainly composed of sulfate. Because particle to particle composition is highly variable much more data analysis is required to reach firm conclusions.



## Preliminary Observations and Conclusions

Air sampled on the September 17 flight appears to be substantially impacted by recent and aged aircraft exhaust as evidenced by high values of  $\text{NO}_x$  and  $\text{NO}_x/\text{NO}_y$ .

Measurements of CO and  $\text{O}_3$  indicate that the sampled air is minimally impacted by surface and stratospheric sources.

Real time aircraft traffic data (ETMS) has been obtained from the Ames CTAS (courtesy of the DFW ATC). Efforts to relate particular features in the  $\text{NO}_x$  data to specific aircraft are ongoing.

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